

### **REMARKS**

The Applicant thanks the Examiner for the thorough consideration given the present application. Claims 1-14 are pending. Claims 1-9 are amended and claims 10-14 are added. Claims 1, 10 and 13 are independent. The Examiner is respectfully requested to reconsider the rejections in view of the amendments and remarks set forth herein.

### **Claim for Priority**

It is gratefully acknowledged that the Examiner has recognized the Applicant's claim for foreign priority.

### **Claim Objections**

The Examiner has objected to claims 1 and 7-9 because of several informalities. In order to overcome this objection, the Applicant has amended claims 1-9 in order to correct the deficiencies pointed out by the Examiner. Reconsideration and withdrawal of this objection are respectfully requested.

### **Specification Objection**

The Examiner has objected to the specification because of several informalities.

In order to overcome this objection, Applicant has amended the specification in order to correct the deficiency pointed out by the Examiner. In

addition, a Substitute Specification and revised Abstract are being provided in order to place the application in better form. Also included is a marked-up copy of the original specification which shows the portions of the original specification which are being added and deleted. Applicant respectfully submits that the substitute specification includes no new matter and that the substitute specification includes the same changes as are indicated in the marked-up copy of the original specification showing additions and deletions. Reconsideration and withdrawal of this objection are respectfully requested.

**Rejections Under 35 U.S.C. §102(b) and §103(a)**

Claims 1 and 2 stand rejected under 35 U.S.C. §102(b) as being anticipated by Tomisawa (U.S. 5,850,458), and

claims 3-9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Tomisawa in view of Fischer (U.S. 5,748,748).

These rejections are respectfully traversed.

While not conceding the appropriateness of the Examiner's rejection, but merely to advance prosecution of the instant application, independent claim 1 is amended herein to recite a combination of elements directed to an acoustic wave sensor for detecting a contact state between an exhaust valve or an intake valve and a valve seat in a cylinder body of a vehicle engine.

In addition, independent claim 10 is added to recite a combination of elements directed to an acoustic wave sensor for detecting a contact state between an exhaust or an intake valve and a valve seat of a valve train of a vehicle engine, including

acoustic wave generating means including a sound emitting device disposed in a manifold of the vehicle engine, and

the acoustic wave sensing means including an acoustic wave sensing part for sensing an acoustic wave outputted from the speaker and converting the acoustic wave into an electric signal, the acoustic wave sensing part being installed under a contact surface between the exhaust or the intake valve and the valve seat.

Further, independent claim 13 is added to recite a combination of elements directed to an acoustic wave sensor for detecting a contact state between an exhaust or an intake valve and a valve seat of a valve train of a vehicle engine, including

an acoustic wave generating means and an acoustic wave sensing means, said acoustic wave generating means including an acoustic wave oscillator, a first amplifier for amplifying the acoustic wave of the acoustic wave oscillator, and a speaker for diverging the acoustic wave of the first amplifier; and

a sound shielding member adjacent to the speaker, the sound shielding member being separately mounted on a port part for preventing the acoustic wave from leaking.

Applicants respectfully submit that the combination of elements as set forth in each of independent claims 1, 10, and 13 is not disclosed or made obvious by the prior art of record, including Tomisawa.

For example, Tomisawa merely teaches a valve 4 in a throttle chamber 4, and throttle sensor 12, speaker 45 for canceling noise in the air intake duct 3, and microphone 46 for sensing any remaining noise, the speaker 45 and the microphone 46 each being installed upstream of the throttle chamber 4, and separated from the exhaust valve and intakes valves of the engine 1 by the throttle chamber 4. Nowhere does Tomisawa suggest an acoustic wave sensor for detecting a contact state between an exhaust valve or an intake valve and a valve seat in a cylinder body of a vehicle engine (as set forth in independent claim 1), or

acoustic wave generating means including a sound emitting device disposed in a manifold of the vehicle engine, and the acoustic wave sensing means including an acoustic wave sensing part for sensing an acoustic wave outputted from the speaker and converting the acoustic wave into an electric signal, the acoustic wave sensing part being installed under a contact surface between the exhaust or the intake valve and the valve seat (as set forth in independent claim 10), or

an acoustic wave generating means and an acoustic wave sensing means, said acoustic wave generating means including an acoustic wave oscillator, a first amplifier for amplifying the acoustic wave of the acoustic wave oscillator, and a speaker for diverging the acoustic wave of the first amplifier; and

a sound shielding member adjacent to the speaker, the sound shielding member being separately mounted on a port part for preventing the acoustic wave from leaking (as set forth in independent claim 13).

The Applicant respectfully submits that the combination of elements as set forth in each of independent claims 1, 10, and 13 is not disclosed or made obvious by the prior art of record, including Tomisawa, at least for the reasons explained above.

Therefore, claims 1, 10, and 13 are in condition for allowance.

Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. §102(b) are respectfully requested.

Moreover, the problem faced by the present inventors is completely different from that face by Tomisawa, and thus, it would be improper for the Examiner to consider a rejection under §35 U.S.C 103(a). The objective of Tomisawa was to minimize noise in an air intake duct by generating a sound wave canceling the noise in the air intake duct.

On the other hand, the present inventor faced the problem detecting the noise in the cylinder body for the purpose of determining the contact state between an exhaust valve or an intake valve and the valve seat on the cylinder body of the engine. Tomisawa suggests no awareness of this problem.

Further, the Applicant respectfully submits that Fischer fails to make up for the deficiencies of Tomisawa with regard to independent claims 1, 10, and 13 of the present invention.

Claims 1, 10, and 13 are in condition for allowance, at least for the reasons stated above. Further, dependent claims 2-9, 11-12, and 14 are in condition for allowance due to their dependency from allowable independent claims, as well as for the additional novel limitations set forth therein.

All claims of this application are now in condition for allowance.

### **CONCLUSION**

Since the remaining patents cited by the Examiner have not been utilized to reject claims, but merely to show the state of the art, no comment need be made with respect thereto.

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. It is believed that a full and complete response has been made to the outstanding Office Action, and that the present application is in condition for allowance.

Application No. 09/749,663  
Amendment dated July 2, 2004  
Reply to Office Action of April 8, 2004

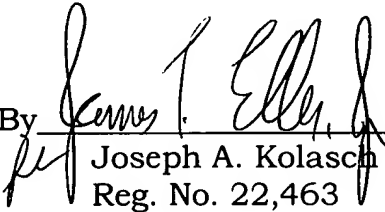
Docket No. 1689-0156P  
Art Unit: 2643  
Page 15 of 16

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, he is invited to telephone Carl T. Thomsen (Reg. No. 50,786) at (703) 205-8000.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17, particularly extension of time fees.

Respectfully submitted,

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Attachment: Revised Abstract and Substitute Specification



**ACOUSTIC WAVE SENSOR FOR DETECTING CONTACT  
STATE BETWEEN A VALVE AND A VALVE SEAT FOR A VEHICLE**

**CROSS REFERENCE TO RELATED APPLICATION**

This Nonprovisional application claims priority under 35 U.S.C. § 119(a) on Patent Application No. 1999-65083 filed in Korea on December 29, 1999, the entire contents of which are hereby incorporated by reference.

**BACKGROUND OF THE INVENTION**

**Field of the invention**

[0001] The present invention is related to an acoustic wave sensor for detecting a contact state between [[a]] an exhaust or an intake valve and a valve seat of a valve train for a vehicle engine, and more More particularly, the invention relates to an acoustic wave sensor which can detect an acoustic wave generated from the outside through a speaker inserted inside of a manifold and through which a displayer can display a degree of a contact state between [[a]] an exhaust or an intake valve and a valve seat of a valve train for a vehicle engine, whereby an operating time can be reduced, a more an ideal working environment can be created, and an efficient inspection process can be performed due to a simplified inspection process.

**Information Disclosure StatementDESCRIPTION OF THE BACKGROUND ART**

[0002] Generally, in the an endurance test for an engine, a main factor to lower a performance of the engine is loss in the compression force. In most cases, the loss in the compression force is caused by a depraved an improper contact state between the exhaust or the intake valve and the valve seat comprised for comprising the valve train of a vehicle engine.

[0003] In the field, therefore, the following works are performed for inspecting a contact state between the valve and the valve seat.

[0004] First, a valve is disassembled from a cylinder head by removing a valve spring and other related elements.

[0005] Second, the valve on which a surface is plastered with red stamping ink evenly is rotated to contact with the valve seat after the valve is inserted into a valve guide of the cylinder head.

[0006] Last, after the valve is disassembled from the cylinder head, the entire surface of the valve seat is inspected with a naked eye to determine whether or not the red stamping ink is printed evenly. This inspection process is performed repeatedly as many as a number of the cylinders.

[0007] However, when a contact state between the valve and the valve seat is inspected by the above manner, it has drawbacks that most of the cylinder heads and valves have to be disassembled. Further, the and reliability of the inspection cannot be obtained since the inspection process is performed with the naked eye, resulting in a different judgment from a different inspector.

[0008] Therefore, ~~it is an urgent~~ there is a need to develop an apparatus to detect [[a]] the degree of a contact state between valve and the valve seat without disassembly of the members, and as well as an apparatus to inspect the contact with reliability.

## **SUMMARY OF THE INVENTION**

[0009] Therefore, it is an object of the present invention to provide an acoustic wave sensor which can detect an acoustic wave generated from outside through a speaker inserted inside of a manifold and through which a displayer can display a degree of a contact state between [[a]] an exhaust or intake valve and a valve seat of valve train for a vehicle engine, whereby an operating time can be reduced, a more ideal working environment can be created, and an efficient inspection process can be performed due to a simplified inspection process.

[0010] The present invention is described in detail as set forth hereunder.

[0011] The acoustic wave sensor according to the present invention comprises an acoustic wave generating means and an acoustic wave sensing means.

[0012] The acoustic wave generating means consists of an acoustic wave oscillator for generating an acoustic wave in response to an operation of a switch, a first amplifier for amplifying the acoustic wave of the acoustic wave oscillator, and a speaker for ~~diverging~~ producing the acoustic wave of the first amplifier,

[0013] The acoustic wave sensing means consists of an acoustic wave sensing part for sensing the acoustic wave ~~diverged through~~ produced by the speaker and converting the acoustic wave into an electric signal, a second amplifier for amplifying the signal of the acoustic wave sensing part and a display part for displaying a signal output from the second amplifier.

[0014] Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0015] For ~~fuller~~ a more complete understanding of the nature and objects of the invention, reference should be ~~had~~ made to the following detailed description taken in conjunction with the accompanying drawing in which:

[0016] FIG. 1 is a schematic view of an acoustic wave sensor for detecting a contact state between ~~[[a]]~~ an exhaust ~~or an~~ intake valve and a valve seat of a valve train for a vehicle engine according to the present invention.

## **DETAILED DESCRIPTION OF THE INVENTION**

[0017] The present invention comprises an acoustic wave generating means and an acoustic wave sensing means. The acoustic wave generating means consists of an acoustic wave oscillator **2** for generating an acoustic wave in response to an operation of a switch **1**, a first amplifier **3** for amplifying the acoustic wave of the acoustic wave oscillator **2**, and a speaker **5** for ~~diverging~~ outputting the acoustic wave of the first amplifier **3**. The acoustic wave sensing means consists of an acoustic wave sensing part **11** for sensing the acoustic wave ~~diverged through~~ outputted by the speaker **5** and converting the acoustic wave into an electric signal, a second amplifier **12** for amplifying a signal of the acoustic wave sensing part **11**, and a display part **13** for displaying a signal output from the second amplifier **12**. The present invention further comprises a sound shielding member **4** mounted to a port part **6** for preventing the acoustic wave from leaking.

[0018] Especially, the speaker **5** of the acoustic wave generating means is installed at a bending portion of a tubular passage **7**, and the acoustic wave sensing part **11** of the acoustic wave sensing means is installed a site under a contact surface between a valve **8** and a valve seat **9**.

[0019] Also, the acoustic wave sensing part **11** of the acoustic wave sensing means comprises a condenser microphone for sensing the acoustic wave.

[0020] Hereinafter, the present invention will be described in greater detail. FIG. 1 is a schematic view of the acoustic wave sensor for detecting a contact state between the exhaust

or the intake valve and a valve seat of valve train for a vehicle engine according to the present invention. A reference numeral 10 indicates a cylinder body.

[0021] As shown in FIG. 1, the present invention is divided into ~~of the~~ acoustic wave generating means and the acoustic wave sensing means.

[0022] Also, in addition, the sound shielding member 4 is installed at certain location for preventing the acoustic wave from leaking.

[0023] The acoustic wave generating means is a means to generate the acoustic wave and treats and output the acoustic wave. The acoustic wave generating means consists of the acoustic wave oscillator 2 for generating the acoustic wave in response to an operation of the switch 1, the first amplifier 3 for amplifying the acoustic wave of the acoustic wave oscillator 2, and the speaker 5 for ~~diverging~~ outputting the acoustic wave of the first amplifier 3.

[0024] Here, the switch 1 is a means for controlling a power supply and the acoustic wave oscillator 2 generates the acoustic wave artificially. It is preferable to use a ~~lower~~ low frequency oscillator, which can be used easily, as the acoustic wave oscillator 2.

[0025] Furthermore, the first amplifier 2 amplifies a low frequency acoustic wave generated in the acoustic wave oscillator 2.

[0026] The switch 1, the acoustic wave oscillator 2 and the first amplifier 3 can be integrated into a single member and are installed outside of the port part 6.

[0027] The speaker 5 ~~diverges~~ outputs the amplified acoustic wave output from the first amplifier 3 where the acoustic wave generated at the acoustic wave oscillator 2 is amplified. Said speaker 5 is installed , at a bending portion of the tubular passage 7.

[0028] In order to prevent a leakage of the acoustic wave, the port part 6 is covered with the sound shielding member 4. It is desirable that the sound shielding member 4 is made of a material such as a conventional glass wool fiber.

[0029] On the other hand, the acoustic wave sensing means consists of the acoustic wave sensing part 11 for sensing the acoustic wave output through a contact surface between the valve 8 and the valve seat 9 toward which the acoustic wave ~~diverged through~~ produced by the speaker 5 is ~~output~~ emitted, the second amplifier 12 for amplifying a micro acoustic wave signal sensed by the acoustic wave sensing part 11 and the display part 13 for displaying an amplified signal through the second amplifier 12.

[0030] The acoustic wave sensing part 11 comprises the condenser microphone for sensing the acoustic wave by using a difference of the pressure between the acoustic waves. The condenser microphone will be described briefly in below.

[0031] A parallel cap with thickness of 50 $\mu$ m is located at a very thin diaphragm and both polarities are opposed against each other so that an air condenser is formed. When a position of the diaphragm is changed in response to a pressure of the acoustic wave, a capacitance is changed in proportion to a displacement of the diaphragm. Therefore, the condenser microphone converts the capacitance into the electric signal.

[0032] On the other hand, the display part 13 displays the amplified signal through the second amplified 13 on a screen, whereby the operator can be ~~find~~ determine whether or not the acoustic ~~waver~~ wave is sensed, or not. Also, the display part 13 preferably consists of a monitor using a liquid crystal display (LCD), etc.

[0033] In the acoustic wave sensor for detecting a contact state between the valve and the valve seat for the vehicle according to the present invention, the speaker to which an acoustic wave generated at an outside is input is mounted in a manifold and the sensing device senses whether the acoustic wave ~~is existed~~ exists or not at lower end of the valve, ~~and a~~ The display part displays a result ~~to find a~~ enabling an operator to determine the degree of ~~[[a]] the~~ contact state between ~~[[a]] the~~ valve and a valve seat. Therefore, the operating time can be

reduced, ~~amore~~ an ideal working environment can be created, and a rapid inspection process can be performed due to a simplified inspection process.

[0034] Although this invention has been described in its preferred form with a certain degree of particularity, it is appreciated by those skilled in the art that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of the construction, combination, and arrangement of parts may be resorted to without departing from the spirit and scope of the invention.